APPENDIX B – COEUR D'ALENE DISTRICT ROAD AND ELK GUIDELINES

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INTRODUCTION

The general guidelines in this appendix are from the 1989 Emerald Empire Management Framework Plan, and only apply to current management (Alternative A). Appendix A contains best management practices (BMPs) that would be applied under Alternatives B, C, and D. The following general guidelines were developed to provide an adequate useable road system while protecting the environment. This expands and supplements the basic guidelines and minimum requirements of the BLM manual; Idaho Department of Water Resources (IDWR) (stream channel protection); Idaho Department of Health and Welfare; Division of Environment (Forest Practices Regulations); and Corps of Engineers 404 Regulations. These guidelines must be flexible, and any deviations would be noted and assessed in the environmental assessment process.

ROAD PLANNING

Road planning in the district would be based on the need to provide an adequate road system to effectively manage the public lands while protecting the resources of the areas. The following guidelines are designed to meet these objectives:

– All roads would be planned and developed in cooperation with other land owners. Plans would be made to serve tributary areas of drainages or ownership block so that only the minimum amount of road necessary to meet management objectives would be planned. Road planning would take into account the long range road needs, expected duration of use of the road, the management objectives, and other policy constraints.

– The road planner must be able to recognize potential impacts to resource values, i.e., silviculture, soils, water, fisheries, wildlife, visual, recreation, etc., and will consult with appropriate specialists when problems are suspected.

– The planned location and design of roads would minimize detrimental impacts on the other resources •of the area. Roads will be planned to avoid sensitive and important areas such as wetlands; floodplains; riparian areas; stream zones; big game use areas; threatened and endangered resource habitat areas; cultural or historical sites; scenic views; mass failure hazard areas; etc. Where it is not practical to totally avoid these areas and it is determined the road is necessary to meet management objectives, mitigation would be included in the design of the road.

– Use of existing roads would be favored over construction of new roads when continued use or reconstruction would result in meeting management objectives without major cost increases while causing the least long run impact to the site.

– In the planning stage, temporary or permanent closure will be considered for all dead end roads or roads with an expected duration of use of 5 years or less.

– Plan roads to be located on natural benches or ridges away from stream courses. Consider using the steepest permissible pitches and grades at stream crossings to avoid closely paralleling the stream for long distances. Planned stream crossings would be kept to a minimum.

– In planning a road system in a municipal watershed, the major objective would be to maintain or improve the quality of domestic water.

ROAD DESIGN AND SPECIFICATIONS

Roads would be designed to meet management objectives using the following guidelines:

– Roads would be designed to be no wider than necessary to accommodate the anticipated use.

– Where feasible, minimize cuts and fills by designing the road to fit the natural terrain.

– Balanced cut and fill road designs would be used where practical. Where not practical, waste areas would be designed so excess material would be placed in stable areas and borrow pits would be designed to minimize impacts to other resource values.

– When roads are planned on slopes exceeding 60 percent, they would be designed so that the road is on a full bench section. Excess material would be placed in stable areas.

– Design roads to leave vegetation that would screen streams, important wildlife areas, and areas of visual contrast (see Buffer Guidelines and Elk Coordinating Guidelines). Vegetation removal would not extend further than the fill limits or 0.9 meters (3 feet) beyond the excavation limits.

– Stream crossings would be selected and designed to involve the least disturbance to banks and existing channels. In doing so, approaches would be designed as near to a right angle with the stream as possible.

– On roads with a life span longer than ***5*** years, bridges or culverts would be designed for all natural water courses. No bridge or culvert should constrict the natural channel.

– Culverts in natural drainage ways would be oriented to the stream channel and would be _j - designed, using half rounds or downspouts, to carry water beyond fills. Protection measures such as riprap would be used to protect streambanks and fills at upstream and downstream ends of culverts and bridges from erosion.

– Relief culverts would be designed with a minimum slope of one percent with sediment catch basins at the culvert mouth. Drainage structures on streams identified as having spawning potential or important fisheries would provide for fish passage. Bridges or natural bottomed culverts are preferable, but if standard culverts are used, they would be designed to meet or exceed Idaho Department of Water Resources (IDWR) regulations and Idaho Fish and Game (lF&G) criteria.

– Road drainage systems would be designed to avoid direct sediment discharge into streams. Use the U.S. Forest Service "Guide for Controlling Sediment from-Secondary Logging Roads" to assist in drainage design.

– Design roads to drain naturally, where possible. Roadside ditches and relief culverts would be designed whenever reliance on natural drainage would not protect the running surface or excavation and embankment areas.

– Soil properties and geologic conditions along the planned road route will be determined before road design begins. These properties and conditions would be included in the design.

– Slash disposal areas and features would be included in the design. Slash and debris may windrowed along the toe of the fill if it is outside the stream protection zone and poses no barriers to wildlife.

– Soil surface stabilization, i.e., riprap, seeding with grasses, or mulching would be designed for all areas where soils are disturbed, especially on large fill areas.

– When roads must cross mass failure hazard areas such as slumps and scarps, the road design must provide for positive stabilization of the rood across the hazard area. Large fill and unstable areas would be protected by surface drainage diversion systems.

– When roads must cross poorly drained or wet soils, the road prism would be designed with a structurally adequate subbase to support expected traffic loadings and with an adequate drainage system.

– Design surface treatments (i.e., rock surfacing) for roads constructed from fine plastic soil materials to prevent rutting in wet conditions and dust problems in dry seasons if road use is planned during these times.

– Design landing areas into the road system. Landings would be designed to be of minimum size necessary and located on stable areas outside stream buffer zones.

ROAD CONSTRUCTION

Roads would be constructed utilizing good construction practices. They would be designed to minimize impacts on the area and include incorporation of the following guidelines:

– Earthwork on roads would not be done when soils are saturated or frozen or during wet periods when material can be eroded and deposited outside the roadway corridor. On cohesive soils, no construction would be done when the soils are in a liquid state or in the upper one-third range of the plastic state.

– Before the end of an operating season and before winter or spring erosion periods, the road segments would be surface bladed or cross drained as needed, and drainage structures would be installed. Other surface protection measures would be taken to minimize erosion from the road corridor.

– During construction, road fill material would be compacted to reduce the entry of water; minimize erosion, and reduce settling. No significant amount of woody material would be incorporated into fills.

– In rippable materials, roads would be constructed with no overhanging banks. Any trees that would be a hazard would be felled concurrent with the construction operation.

– Potentially unstable or erodible material exposed (i.e., road embankments) or generated (i.e., waste piles) during construction would be stabilized as soon as feasible by seeding, compacting, riprapping, benching, mulching, or other suitable moans.

– Drainage structures would be installed as soon as feasible. If not feasible, cross drains would be installed.

– All drainage ways would be cleared of debris generated during construction.

ELK HABITAT COORDINATING REQUIREMENTS

Early in 1976, wildlife biologists in northern Idaho representing the Idaho Fish and Game Department, U.S. Forest Service, Bureau of Land Management, and the University of Idaho began development of a procedure for coordination of silvicultural activities with elk habitat needs similar to that developed by Black, Scherzinger, and Thomas (1976) for the Blue Mountains of Oregon and Washington, but adapted to the habitat needs of Rocky Mountain elk in northern Idaho. In July 1977, a 3-day meeting of those biologists was held at the Idaho Panhandle National Forests Supervisor's Office in Coeur d'Alene, Idaho. Guidelines were developed at this meeting, utilizing research data from literature reviews, personal communication with elk research biologists, and discussions between participants. The resulting guidelines contained the best information available on the effects, relationships, and coordination of silvicultural practices and elk habitat management for the northern Idaho forests. These guidelines would, of necessity, be updated and modified as additional data becomes available.

The objective of these guidelines is to provide forest land managers in northern Idaho a means by which to assess and evaluate the effects of silvicultural prescriptions, timber harvest techniques, and other land management decisions on Rocky Mountain elk and their habitat. It is not meant to provide all the answers for optimization of elk habitat but rather to display cause and effect relationships and to provide alternatives for consideration in land use decision making.

Within the guidelines are definitions of terms used to describe elk habitat, some of which are in the glossary, and descriptions of seasonal habitat requirements of elk. Following is the body of the guidelines listing points of concern of timber harvest methods; slash disposal methods, etc.; research findings on the points specified; and recommendations for each point of concern.

RECOMMENDATIONS FOR COORDINATING SILVICULTURE WITH ELK HABITAT REQUIREMENTS

TIMBER HARVEST

General

The action of removing coniferous vegetation from a given area by logging procedures has the effect of altering the balance between cover and forage areas and disrupting movements and distribution. Since the forage:cover ratio is used to describe optimum elk habitat, forest managers must understand that the balance between these two entities by habitat type will govern the level of possible use of tie area by elk. Utilizing the broad forage:cover ratio concept put forth for the Blue Mountains by Black et al. (1976), these recommendations adapt that concept to northern Idaho and go one step further by providing forage:cover ratios by habitat types.

Silvicultural Methods

Point of Concern

The method of timber harvest selected for a given area will determine the resultant forage produced within the capability of the site, it then follows that the utilization of the various harvest methods with regard to size, degree, and arrangement of the cut will govern the expected elk use after the logging action.

Research Findings

Irwin (1976) reported that the method of harvest will influence the resultant forb and shrub production on the harvest areas, with clearcut sites producing the most palatable forage and partial cuts the least.

Allen et al. (1976) recommend small openings "...but cutting units as large as 100 acres may be acceptable in some circumstances." A management plan for elk on the Flathead National Forest indicates no clearcut to be over 35 acres in size-(Baglien and Biggins, 1976). Hershey and Leege (1976) found 80 percent of all elk groups (122 observations) to use portions of clearcut within 46 meters (150 feet) of the timbered edge. They further indicate that elk were more apt to use portions of clearcuts farther from the edge if "...scattered clumps of trees remained standing within the logged area."

Lyon (1976) analyzed pellet group distributions and found heavier elk use in openings in the 10 to 40 acre range, especially if slash was adequately disposed of. In southwestern Oregon, Harper (1969) found elk use of openings to decrease sharply at distances greater than 274 meters (300 yards) from the edge.

Reynolds (1962, 1966) found that forage sites created by harvesting timber have decreased elk use at distances beyond 183 meters (600 feet) from the edge of cover. Utilizing the foregoing research, Black et al. (1976) specified that in order to qualify under optimum habitat arrangements, no forage area should be wider than 366 meters (1,200 feet).

Associated with the size, type, and shape of cut are the leave areas which will remain undisturbed until the vegetation of adjacent cutover areas qualifies as hiding cover. Black at al. (1976) stated that the optimum size for thermal cover units on summer and spring-fall range is 30 to 60 acres.

Reynolds (1966) found that elk used the area that extended 137 meters (450 feet) into the forest from the forest edge. With this information, Black at al. (1976) prescribed hiding cover patches of between 243 meters and 488 meters (800 and 1,600 feet) in width.

Recommendations

(Variations from literature have been made to adapt to the northern Idaho situation.)

– Any silvicultural method which changes the description of an area from cover to forage, according to our definition, should be confined to an area with a width of from 243 meters to 305 meters (800 to 1,000 feet) that is bordered on all sides by cover of not less than 243 meters (800 feet) width.

– When seeking to provide maximum forage for elk through a harvest method, choose the treatment which yields the highest Relative Value Index for forage production.

– A 3,800-acre home range should be the management unit in which an elk's seasonal requirements will be satisfied. Of the total cover requirement for a given unit, one-half should be hiding cover, one-fourth thermal cover, and one-fourth any combination of hiding and thermal cover. One-fourth of all hiding and thermal cover should also qualify as security cover.

SLASH DISPOSAL METHODS

Point of Concern

The accumulation and treatment of logging debris or slash is inherent with any timber harvest action. This byproduct of timber harvest has the potential to affect elk behavior and movement both in the cut area and adjoining uncut area. The method of disposal utilized will affect the vegetative response towards elk forage production.

Research Findings

Lyon (1976) stated that elk use diminished when slash inside the opening exceeded 0.5 meters (1.5 feet) in depth and dead and down material outside the opening exceeded 0.5 meters (1.5 feet). The treatment of the slash, be it seasonal broadcase burning; handpiling and burning; or lop and scatter, will affect the degree and amount of elk forage produced on the treatment site, assuming the potential does exist (Irwin 1976).

Recommendations

– In order to insure the highest elk use possible in logged areas, particularly forage areas, slash depth should not exceed 0.5 meters (1.5 feet).

– When developing an area with elk forage production as a consideration, use a slash disposal treatment which will yield the highest value for forage production.

TIMING AND DURATION OF TIMBER HARVEST

Point of Concern

The season of the year and the length of time during any one year that logging operations disturb areas inhabited by elk influence normal use patterns of the animals. It is important that considerations regarding conflicts between elk use and logging activities be realized and the two be coordinated to mitigate adverse impacts resulting from the displacement of the animals.

Research Findings

Lyon (1975) stated that displacement of elk, which is considered temporary, has been detected as far as 4 miles from the area of summer logging activity. Ward (1976) found that elk preferred to be at least 0.5 miles from logging activity.

Recommendations

- In that sales are currently designed to run the shortest period of time, it is necessary to work within the specified time frame by designating compartments and order of logging through sale layout and contract stipulations to eliminate random logging over the entire area.

- Where feasible, logging would not be conducted on areas at the time of year when elk would normally be using them. For example, refrain from logging winter ranges during the winter months.

- Within the plan for timber sales on elk summer range, provide adjacent security areas for the animals to move into during periods of timber harvest or road building activity.

SPECIAL HABITAT COMPONENTS

Point of Concern

Within the spring, summer, and fall ranges of elk there are certain special physical components or habitat areas which receive an inordinate amount of elk use. These include salt licks, wallows, established travel routes, and calving areas. The conservation and protection of these areas is considered to be important in preserving the integrity of the seasonal habitat.

Research Findings

Moist Sites

In the findings and recommendations of the Montana Cooperative Elk-Logging Study (Allen et al. 1977), the importance of moist sites in elk summer range is stressed. In Montana, most of the important wet sites were located within the Abies lasiocarpa habitat series (Pfister 1976); however, these components in northern Idaho may also be found in those types within the pachistima union (Daubenmire 1968). These sites are found in drainage heads bordering streams or marshy meadow; moist swales; or benches studies indicate these sites are important as food sources prior to the breeding season and during the reproductive period. They also provide thermal and security cover.

Wallows

Elk wallows are shallow pools normally located in boggy areas or where water seeps from a slope into a flat bench. Murie (1951) indicates its function is to soothe the rutting bull by cooling the body and serving as an outlet for pent up energy. Struhsaker (1967) speculated that "…the function of wallowing is to facilitate the location of bulls by one another." Cow elk use the wallows in similar fashion to the bulls in later summer. Often the wallows remain as clear pools during the spring and early summer to provide a water source for elk and other species. Wallows are a preferred habitat component for elk and are used to varying degrees when available.

Licks

Elk utilize mineral licks when available in northern Idaho, most of these licks are the sites of past and current salting programs (either for game or livestock) or where naturally salty water- and/or soil is present. Dalke et al. (1965) analyzed the water from natural salt licks in north-central Idaho and found that sodium seemed to be the element attracting elk. They found elk use of licks to occur primarily between the third week in April and late August. Peak use occurred during the second and third weeks of June. They also reported that salt licks within succulent herbaceous areas were used considerably more than licks in shrubby areas.

Murie (1951) states "…that wild game species need salt is open to serious question…wild animals are adapted to natural food sources." However, Botkin et al. (1973) suggests that the availability of sodium on Isle Royale, Lake Superior, controls the moose population. So the question of how critically elk need these areas remains unanswered; however, as with wallows, licks are heavily used when available and we therefore believe in protecting them from disturbance.

Rub Areas

Prior to and during the rut, bull elk rub their antlers, removing the velvet and thus finalizing the hardening process. As the rut progresses, the rubbing and fighting of small trees is intensified. Some discussion has occurred over the preference for specific areas for use of "rub trees" by bulls during rutting season. It is our opinion that such areas coincide with preferred habitat components for other needs such as thermal and hiding cover and wallows or licks.

Calving Areas

The term "calving area" is given to those areas which the cow elk traditionally utilize for giving birth. These areas, though often hard to positively identify, have a mixture of components which make them attractive to the elk for calving purposes. Thomas et al, (1976) provided the following capsule description of probably calving habitat:

"In short, calving grounds are located in the transition zone where escape and thermal cover in the form of forests exist for the cows; where there is hiding cover in the form of shrubs or dead and down logs, etc., for relatively immobile newborn calves; where succulent forage is available for the lactating female; where water is within 305 meters (1,000 feet); and where the terrain is gently, allowing easy movement of the cow immediately before and after parturition."

Travel Lanes

Within forested areas, elk move from forage to cover areas and from one seasonal range to another along selected and traditional routes. Logging activities tend to disrupt or block these travel routes resulting in displacement or elimination of elk from formerly utilized habitats (Leege 1976 and Lyon 1975).

Recommendations

– Whenever these special components are encountered in connection with a timber sale action or questions arise as to their occurrence or importance, a wildlife biologist must evaluate these on a case-by-case basis.

– In regard to licks and wallows, these should be preserved and buffered from disturbance by a minimum of 1.5 sight distances.

– Whenever the existence of calving habitat is confirmed or expected, it should be reviewed by the wildlife biologist as it is considered to be an extremely important habitat component.

– Upon identifying the travel lanes, the following points should be considered: 1) maintain known travel routes in continuous hiding or thermal cover for at least three sight distances wide; and 2) travel lanes should be provided for saddles and ridges as these are points of heavy travel flow by the animals. These should be tied to forage and cover areas.

– If an area within a proposed timber sale exhibits a high density of "rub trees", an effort should be made to preserve that area or areas of similar physical and vegetative makeup within the home range.

– No activities associated with timber harvest or pre-sale activities such as road building can be permitted in calving areas from the period of May 1 through July 15 (Roberts 1974).

ROAD EFFECTS

That elk are adversely affected by roads is well documented in literature. Such adverse effects vary from disturbance due to presence of vehicular travel to increasing hunter access, thus allowing over harvesting of elk in localized areas.

Habitat Use and Roads

Studies indicate that elk do not frequent areas adjacent to roads in proportion to similar habitat in undisturbed areas. Hershey and Leege (1976) and Ward (1976) found elk use to be disrupted within .4 kilometers (.25 miles) on either side of a road. Coggins (1976) reported high road density and constant vehicle travel excluded elk from many areas of escape cover. Studies of the effects of roads on elk use by Perry and Overly (1976) found that generally, roads significantly reduced elk use of adjacent habitat below average levels.

Data indicate that elk respond less to constant non-stopping vehicular travel (usually associated with main roads) than to periodic slow vehicle use where vehicles stop and human activity is associated with it (Ward, 1976; Burbridge and Neff, 1976).

Human Access and Roads

The major consideration in the roading of elk habitat is the human access it will allow into elk sanctuary areas. Thiessen (1976) states, "The substantial reduction of elk…between 1960 and 1974 was probably caused by direct overharvest of female elk. This was made possible by a combination of proliferating access into the unroaded elk sanctuaries, coupled with hunting seasons promoting high level hunting opportunity."

Leege (1974) believed that the decline of elk in the Pete King Creek area was due to "increased access into the timbered portions of the drainage brought about by numerous logging roads (making) elk more vulnerable to hunters…" The size of security areas that should remain after logging will vary with the distance from open roads, since most hunters do not penetrate much beyond one mile from an open road (Ream et al. 1974).

Roads may limit or exclude elk use of preferred habitat when:

- Road locations are such that adequate buffer strips are not provided between the road and the habitat in question.
- Road density is such that minimum security cover needs are eliminated.
- Road activity is such that elk tolerance limits are exceeded.
- Road locations that interfere with major travelways, such **as** saddles and ridge tops.

Roads may become barriers to elk movements when:

- Cut slopes are over 2.5 meters (8 feet) high with a ¾ to 1 or steeper slope.
- Slash on fill slopes (below road) is in excess of 0.5 meters (1.5 feet) deep and has less than one opening per 200 meters (650 feet).

Recommendations

- All elk trails crossed by roads should provide access on cut slopes not to exceed natural gradients. If slash is piled along roads, openings 4 meters (13 feet) wide are required at trail crossings.
- Where cut slopes are over 2.5 meters (8 feet) in height and/or have a greater than .75 to 1 slope, elk access will be provided at major trails and travelways.
- Slash disposal for road construction shall be such that no barriers to elk movement are created. Slash depths should not exceed 0.5 meters (1.5 feet) in depth, in areas where complete slash disposal is impractical, openings 4 meters (13 feet) wide at 200 meter (650 feet) intervals are essential.
- Narrow rights-of-way should be maintained. Vegetation removal along roadsides should not extend further than excavation or fill.
- Roads near meadows and other openings, including cutover areas, should have a minimum of 400 meter (1,300 feet) forested barrier between the road and the opening.
- Roads should avoid saddles and ridge tops whenever possible.

Road Closures

The ability to close roads provides the land manager with numerous options to control and uses in a given area.

Permanent Closures

Permanent closures have many advantages in that they insure greater security for elk and provide increased forage when the roadbed revegetates to native and planted species. In any sale area, all temporary and spur roads should normally be permanently closed.

Temporary Closures

Temporary closures may be utilized on system roads where continued access is necessary. Temporary closures may be implemented to:

- Reduce hunter access. This would provide elk with sanctuaries during hunting season. These closures should be initiated beginning September 1 and continue through the elk hunting season.
- Protect special habitat. Such closures would provide protection to wallows, calving areas, security cover, etc.
- Reduce stress to wintering elk. Such closures would protect elk on wintering ranges from harassment by snowmobilers and other motorized activity.

Gate Closures

Gates provide the option to permanently close roads; to close to public access but allow administrative uses; to close during period when resource damage can occur; or to provide for future closure should indications of resource damage occur.

Recommendations

- Gates should be installed at onset of road building activity.
- Gates entering any active timber sale area should be closed and locked during any period of inactivity exceeding 48 hours.
- Gates should be signed to indicate: 1) the season or period of closure, and 2) the reasons for closure.

Buffer Strips Along Roads

Constant human activity and traffic on forest roads left open to motorized travel serve to render portions of otherwise usable habitat useless to the elk. From this standpoint, it is necessary to utilize buffer strips to reduce the adverse impacts on roads that cannot be closed.

Recommendations

- Allow for hiding cover to act as buffer strips along permanent open roads.
- Tie these buffer strips to travel lanes which are provided throughout the sale.

- The accepted width of a given buffer strip should be minimum of 1.5 sight distances:

GRAZING AS RELATED TO SILVICULTURAL PRESCRIPTIONS

On occasion, specific silvicultural prescriptions may allow for short-term livestock grazing opportunities. The effects of livestock grazing as it applies to elk and their habitat indicate, for the most part, that competition for forage exists and that inter-specific interaction occurs.

Predicting Elk Responses to Habitat Changes and Disturbance Factors

Cover:Forage Ratios

Wildlife biologists in northern Idaho generally concur that on summer and spring-fall range cover is a more important component of elk habitat than forage since it is more frequently lacking. Consequently, when logging, there is a greater potential for reducing elk use by removing cover than there is for increasing elk use by improving forage production. However, on winter and early spring ranges, forage requirements are commonly higher than the habitat can easily provide. Hence, on these ranges, forage production increases which result from logging can be a major benefit.

Some habitat types are especially important as summer range because of the high water table and subsequent cool temperatures and succulent vegetation they possess. Maximum elk use is assumed to occur in these areas when 75 percent is in cover. Any further removal of canopy tends to decrease the attributes elk seek there during the hottest part of the year.

Other habitat types provide dense thermal cover on summer and spring-fall ranges but are not as moist and, therefore, not as attractive to elk during mid-summer. Those areas can be made more attractive by increasing forage production which will be utilized by elk primarily during spring, early summer, and late fall.

A third category of habitat types occurs primarily at lower or higher elevations where summer use by elk is usually light because of a lack of thermal cover and/or inherently poor forage production. The low elevation habitat types are more commonly used by elk during the winter and early spring months, and any logging should be evaluated in light of elk needs at those times of the year. In some cases it will be necessary to establish season of use by ground surveys before logging can be properly evaluated.

On winter ranges, forage is usually a more critical factor than is cover. A forage:cover ratio of 75:25 is best where snow depths are less than 0.5 meters (1.5 feet) on the ground during most days of an average winter. Cover needs are minimal on this type of winter range if isolated from man's activities (Leege and Hickey 1977). However, Montana studies indicate elk prefer dense timber stands and larger trees for bedding cover. These areas are normally near foraging areas. Bedding areas were abandoned following heavy selection logging (Beall 1976). When snow depths average 0.5 meters to 0.8 meters (l.5 to 2.5 feet), a 60:40 ratio is necessary. On winter ranges where snow depths are more than 0.8 meters (2.5 feet) on most winter days, a 40:60 ratio provides optimum habitat. The additional cover is necessary to intercept the snow and provide for ease of movement. However, the proper ratio and snow depths are only one factor of winter range needs. Range quality is largely determined by the amount of palatable and nutritious browse being produced in forage areas. Other important factors include aspect, location, and juxtaposition with other habitat requirements.

Roads

It should be made clear at this point that optimum habitat assumes a proper distribution of cover and forage and also, more importantly, that the habitat is not being adversely influenced by man. When frequent man-associated disturbances are introduced, an elk's need for cover increases significantly. Roads are the means by which most man-associated disturbances arrive on elk ranges, and consequently, a method of predicting effects of roads on elk use has been devised.

Adjacent Areas

An area proposed for a timber sale cannot be properly evaluated for elk use without giving some consideration to surrounding habitat. The optimum forage:cover ratio in the proposed sale area will depend to some extent on the forage:cover ratios and access roads in the areas on all sides of it. For example, a 100-acre patch of standing timber is more important as hiding and/or thermal cover if the 500 acres immediately adjacent on all sides have been recently clearcut than if similar timber still remains on all sides.

Sales should be evaluated on how they affect not only the area within the sale boundary, but the entire home range of the elk which use the sale area. As noted earlier, the average summer home range for a cow elk is about 6 square miles (3,800 acres) (Zahn 1974 and Ream et al. 1974). We propose this to be the size of the land unit on which a logging sale impacts elk. To define the area, the center of the sale area is estimated and serves as the center of a circle which encompasses the home range acreage.

If the sale area is larger than 3,800 acres, home range acreage need not be considered, and only the area within the sale boundary is evaluated. If portions of the sale area lie outside the home range circle, those portions should be included. In both the sale and home range acreages the term "adjacent area" then refers to that area outside of the sale area boundaries but within the home range.